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# Trawl Catch Statistics from Quesnel Lake: 1986 - 1990

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## ABSTRACT

H. J. Enzenhofer, C. W. Mueller, and J. M. B. Hume. 1991. Trawl catch statistics from Quesnel Lake: 1986 - 1990. Can. Data Rep. Fish. Aquat. Sci. 863: 27 p.

We collected 5 years of pelagic fish stock information using mid-water trawls in Quesnel Lake. After at least one month in formalin each sample was measured and weighed. Summary statistics were calculated and length frequencies were plotted by survey and species. Mean weight in August ranged from 2.43 g in dominant years to 1.82 g in sub-dominant years.

## RÉSUMÉ

H. J. Enzenhofer, C. W. Mueller, and J. M. B. Hume. 1991. Trawl catch statistics from Quesnel Lake: 1986 - 1990. Can. Data Rep. Fish. Aquat. Sci. 863: 27 p.

Nous avons colligé les informations recueillies pendant cinq années sur les stocks de poisson pélagique du lac Quesnel à l'aide de chaluts. Après au moins un mois dans le formaldéhyde, chaque échantillon a été mesuré et pesé. Les statistiques sommaires ont été calculées et la distribution de la fréquence des longueurs a été transposée sur graphique en fonction de l'enquête et de l'espèce. Le poids moyen en août variait de 2,43 g chez les années dominantes et 1,82 g chez les années sous-dominantes.

## INTRODUCTION

The Fraser River drainage basin is one of the world's major salmonid systems and is the world's largest single river producer of sockeye salmon (*Oncorhynchus nerka*) (Northcote and Larkin 1989). Within the Fraser system, Quesnel Lake is one of the largest producers of sockeye salmon, producing 11.7 million adults (catch and escapement) in 1989 (Pacific Salmon Commission 1990) (Fig. 1).

Escapement to the lake varies on a four year cycle and ranged from 3,700 to 1,496,700 during our study. The samples collected during this period will contribute toward determining the carrying capacity of Quesnel Lake and other comparable interior lakes.

Along with other data these results will be also used for examining in-lake factors (i.e. food supply) which may contribute to cyclic dominance, and will be used in evaluating the effectiveness of various enhancement activities under consideration. These include spawning channels, lake fertilization, and increased escapement through experimental management of the fishery.

## METHODS

Quesnel Lake was divided into 6 trawl sample areas which contained 2 or 3 randomly selected hydroacoustic transects perpendicular to shore (Fig. 2). These areas and transects remained the same for each survey. Methods used to estimate fish densities using acoustic and trawl results are described in Nunnallee (1973) and in Burzcynski and Johnson (1986). Trawl samples were captured using a 3 m by 7 m midwater trawl capable of fishing to 64 m at the middle of the mouth opening. The trawl net is described in Enzenhofer and Hume (1989). Depth and duration of each trawl were determined by visually estimating density from the acoustic echogram. Normally, only one tow per area was done but if the echogram showed that the fish were stratified into layers then a trawl was done through each layer.

Captured fish were anaesthetized in a 1% solution of 2-phenoxyethanol to prevent them from regurgitating their stomach contents and then preserved in 10% formalin. Each trawl catch was labelled and a trawl log was kept recording survey, tow, area, date, time, duration of trawl, depth, and weather. The total catch from each trawl was preserved.

The catch was left for at least one month to stabilize fish size before measuring (Rogers 1964). Fish were weighed to 0.01 g using a Mettler PN 1210 electronic balance and measured to the nearest mm. Scales and the anterior portion of the stomach were removed from a maximum of 20 sockeye fry per trawl for aging and diet analysis. Each fish was numbered consecutively to reference the stomach and scale information to fish size and to aid in error checking.

Raw data were entered into a Lotus 123 spreadsheet for statistical analysis. Each survey was entered as a separate file and was organized for analysis by tow, area and species. Sockeye were divided into age 0, age 1, and age 2+. These categories were determined from the scale aging analysis, length frequency distributions, and somewhat arbitrarily by time of year based on fry emergence. Age 0 are fry from the current year's emergence and have not been in the lake over the winter. Age 1 are from the previous year's emergence and have been in the lake over 1 winter. Age 2+ are determined to have been in the lake for at least 2 winters and may also include older kokanee (landlocked *O. nerka*).

After numbers were entered, length frequencies were plotted by survey number and species. Summary statistics (n, maximum, minimum, mean, standard deviation and variance) were calculated for length and weight by survey number and species and then by tow number and species.

## RESULTS

In 5 years on Quesnel Lake, 15 surveys and 79 tows were carried out. A total of 5,185 sockeye (5,159 age 0, 16 age 1, 10 age 2+), 4 coregonidae, and 1 cyprinidae were captured. The results are presented in a tow log summarizing the catch and conditions of capture; a table summarizing the data by survey; a table summarizing the data by individual trawl; and a length frequency graph for each survey.

## ACKNOWLEDGEMENTS

We wish to acknowledge the efforts of Ken Morton, Steve MacLellan and Bob Johnson in the collection and analysis of these

data. We also wish to thank Vivian Ogilvie for assistance in analysis and editing of this report.

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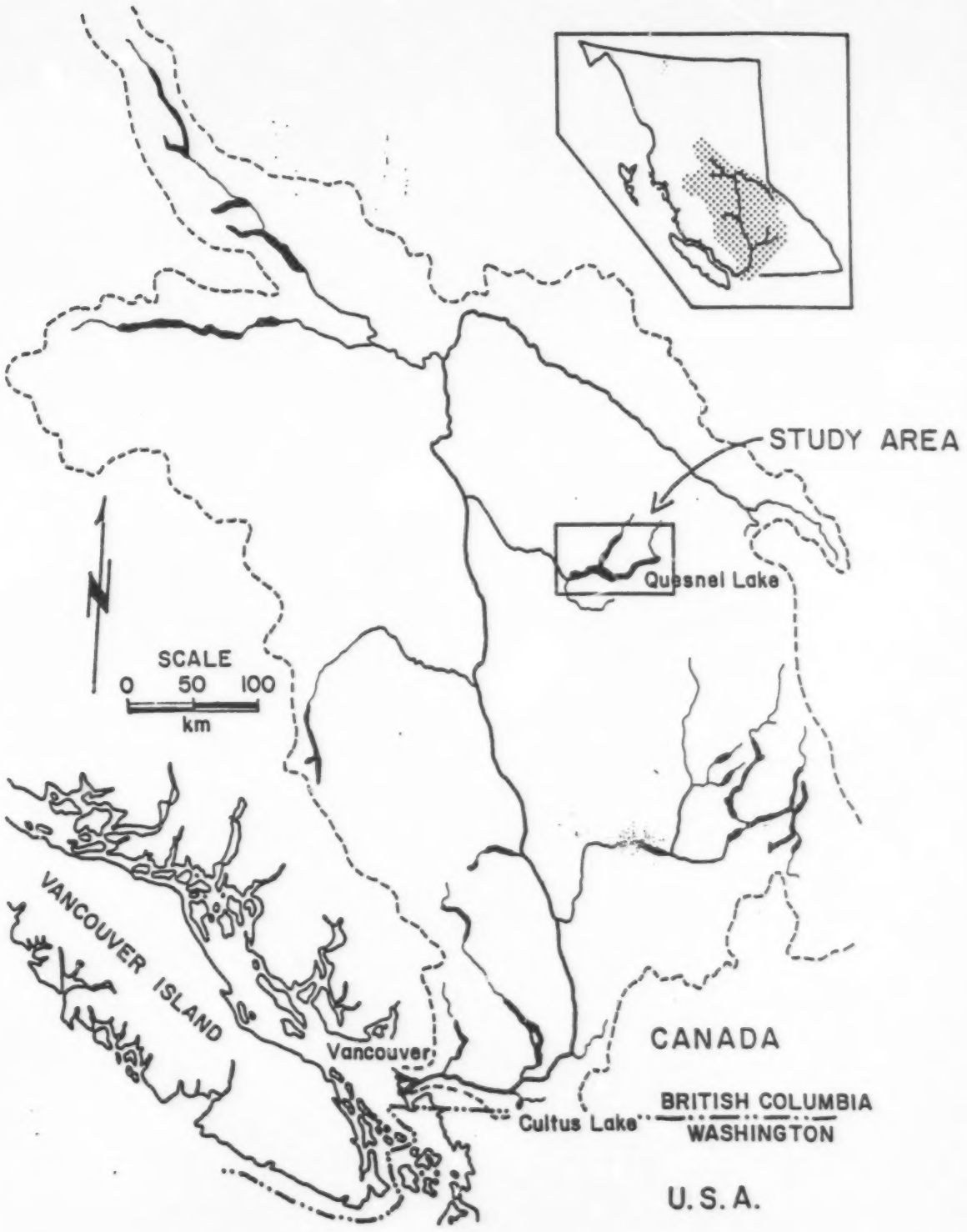



Fig. 1. Map of the Fraser River drainage basin indicating the Quesnel Lake study area.

TABLE 1. Code number explanation for tow summary.

| SKY: | LIGHT: | WIND: |
|---|---|---|
| 0 - NO OBSERVATION | 0 - NO OBSERVATION | 0 - NO WIND |
| 1 - 10% CLOUD COVER | 1 - DAYLIGHT | 1 - NE |
| 2 - 50% CLOUD COVER | 2 - TWILIGHT | 2 - EAST |
| 3 - > 50% CLOUD COVER | 3 - DARK | 3 - SE |
| 4 - FOG OR HAZE | 4 - MODERATE MOONLIGHT | 4 - SOUTH |
| 5 - INTERMITTENT RAIN | 5 - BRIGHT MOONLIGHT | 5 - SW |
| 6 - CONTINUOUS RAIN | | 6 - WEST |
| 7 - SNOW, RAIN OR BOTH | | 7 - NW |
| 8 - HAIL | | 8 - NORTH |
| 9 - THUNDERSTORM | | 9 - NO OBSERV |

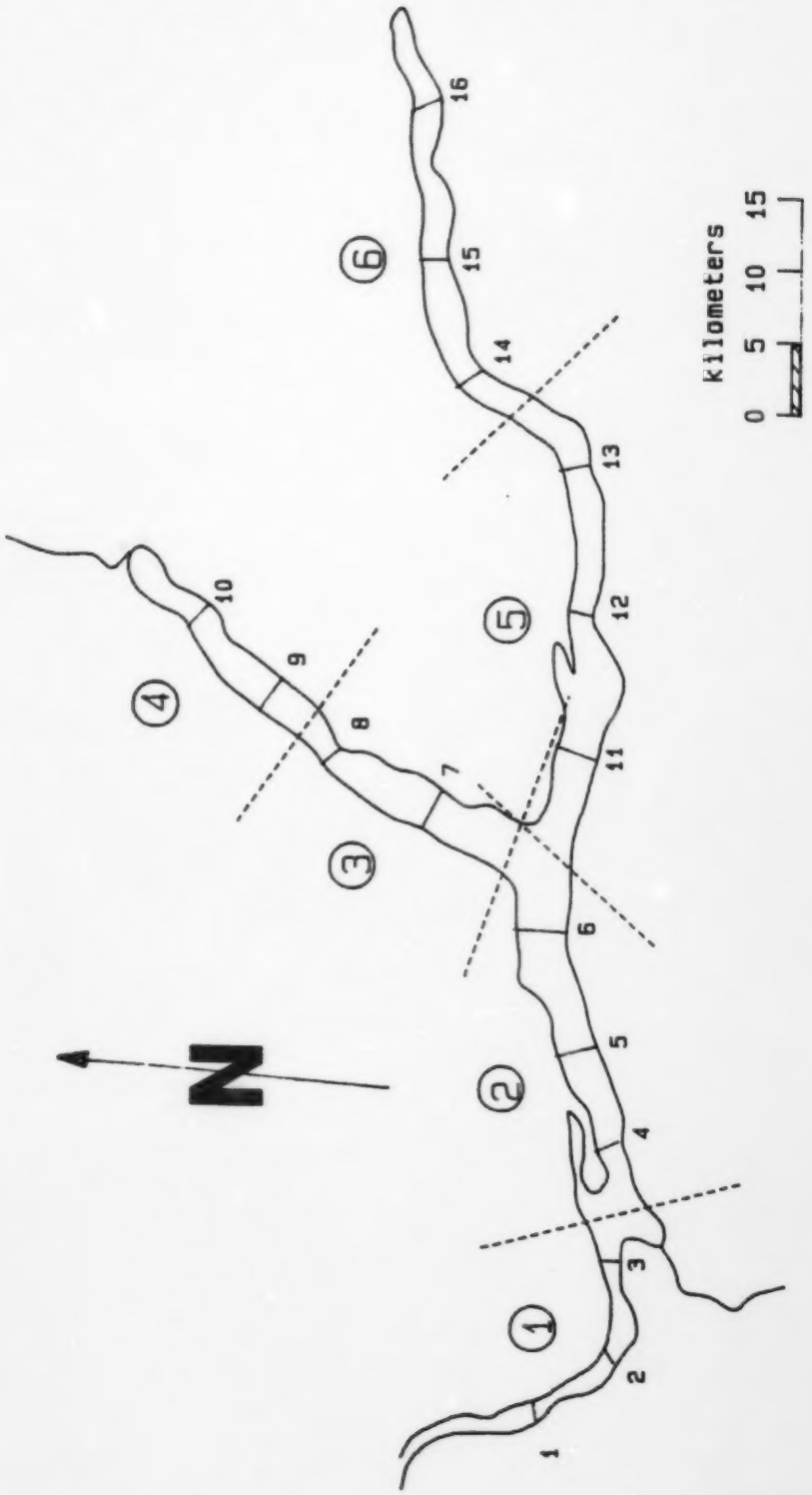



Fig 2. Map of Quesnel Lake showing areas and transects.

Table 3a - Tow summary for Quesnel Lake

| SURVEY # | SAMPLE DATE | TOW | AREA | SAMPLE TIME | DURATION (min) | DEPTH (m) | SKY CODE | LIGHT CODE | WIND DIR | SURFACE TEMP (C) | CATCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8602 | JUL 22/86 | 860006 | 1 | 21:45 | 5 | 7 | 3 | 3 | 7 | 17.0 | NONE |
| | JUL 22/86 | 860007 | 1 | 22:10 | 5 | 13 | 3 | 3 | 0 | 17.0 | 27 AGE 0 |
| | JUL 23/86 | 860008 | 2 | 00:26 | 3 | 13 | 3 | 3 | 0 | 16.5 | 63 AGE 0 |
| | JUL 23/86 | 860009 | 3 | 02:20 | 15 | 13 | 3 | 3 | 0 | 16.0 | 94 AGE 0 |
| | JUL 23/86 | 860010 | 5 | 22:58 | 10 | 13 | 3 | 3 | 0 | 16.0 | 65 AGE 0 |
| | JUL 24/86 | 860011 | 4 | 01:45 | 10 | 13 | 3 | 3 | 0 | | 61 AGE 0 |
| 8604 | AUG 24/86 | 860020 | 1 | 20:58 | 20 | 19 | 1 | 3 | 0 | 15.0 | 2 AGE 0 |
| | | | | | | | | | | | 1 CYPRINID |
| | | | | | | | | | | | 1 WHITEFISH |
| | AUG 24/86 | 860021 | 2 | 23:00 | 3 | 19 | 1 | 3 | 0 | 15.0 | 40 AGE 0 |
| | AUG 25/86 | 860022 | 3 | 00:30 | 5 | 13 | 1 | 3 | 0 | 15.0 | 34 AGE 0 |
| | AUG 25/86 | 860023 | 4 | 01:53 | 10 | 13 | 3 | 3 | 0 | 16.0 | 23 AGE 0 |
| | AUG 25/86 | 860024 | 6 | 20:22 | 3 | 13 | 3 | 3 | 0 | 16.0 | 102 AGE 0 |
| | AUG 25/86 | 860025 | 5 | 22:30 | 5 | 13 | 3 | 3 | 0 | 16.5 | 25 AGE 0 |
| 8606 | SEP 24/86 | 860028 | 2 | 19:20 | 3 | 19 | 3 | 3 | 0 | 13.5 | 17 AGE 0 |
| | SEP 24/86 | 860029 | 2 | 21:45 | 10 | 25 | 3 | 3 | 0 | 13.5 | 18 AGE 0 |
| | SEP 25/86 | 860030 | 2 | 19:22 | 15 | 19 | 3 | 3 | 0 | 12.0 | 35 AGE 0 |
| | SEP 25/86 | 860031 | 4 | 21:20 | 20 | 22 | 3 | 3 | 0 | 12.0 | 4 AGE 0 |
| | SEP 25/86 | 860032 | 3 | 23:15 | 20 | 19 | 3 | 3 | 0 | 12.0 | 13 AGE 0 |
| | SEP 26/86 | 860033 | 5 | 19:00 | 20 | 21 | 3 | 3 | 0 | 12.0 | 78 AGE 0 |
| | SEP 26/86 | 860034 | 5 | 19:55 | 20 | 27 | 3 | 3 | 0 | 12.0 | 06 AGE 0 |
| | SEP 26/86 | 860035 | 6 | 21:00 | 7 | 17 | 3 | 3 | 0 | 11.0 | 70 AGE 0 |
| | SEP 26/86 | 860036 | 4 | 22:25 | 20 | 20 | 3 | 3 | 0 | 12.0 | 22 AGE 0 |
| 8607 | OCT 28/86 | 860037 | 2 | 19:15 | 10 | 32 | 1 | 3 | 2 | 9.0 | 109 AGE 0 |
| | OCT 28/86 | 860038 | 2 | 19:35 | 10 | 13 | 1 | 3 | 2 | 9.0 | 32 AGE 0 |
| | | | | | | | | | | | 1 AGE 2+ |
| | OCT 28/86 | 860039 | 1 | 20:48 | 20 | 26 | 1 | 3 | 2 | 9.0 | 8 AGE 0 |
| | OCT 28/86 | 860040 | 3 | 23:20 | 15 | 37 | 1 | 3 | 2 | 9.0 | 29 AGE 0 |
| | OCT 29/86 | 860041 | 4 | 00:30 | 10 | 7 | 1 | 3 | 2 | 9.0 | 4 AGE 0 |
| | OCT 29/86 | 860042 | 4 | 00:45 | 15 | 38 | 1 | 3 | 2 | 9.0 | 121 AGE 0 |
| | OCT 29/86 | 860043 | 5 | 19:00 | 10 | 25 | 1 | 3 | 2 | 9.0 | 30 AGE 0 |
| | | | | | | | | | | | 1 AGE 1 |
| | OCT 29/86 | 860044 | 6 | 20:00 | 10 | 27 | 2 | 3 | 2 | 9.0 | 47 AGE 0 |
| 8703 | AUG 11/87 | 870020 | 2 | 24:00 | 15 | 17 | 3 | 3 | 3 | | 13 AGE 0 |
| | | | | | | | | | | | 1 AGE 1 |
| | | | | | | | | | | | 2 AGE 2+ |
| | AUG 12/87 | 870021 | 4 | 03:15 | 10 | 20 | 3 | 3 | 0 | | 24 AGE 0 |
| | | | | | | | | | | | 1 AGE 2+ |
| | AUG 12/87 | 870022 | 3 | 03:50 | 15 | 17 | 3 | 3 | 0 | | NONE |
| | AUG 12/87 | 870023 | 6 | 22:45 | 20 | 17 | 1 | 4 | 0 | | 69 AGE 0 |
| | | | | | | | | | | | 11 AGE 1 |

Table 3a - Tow summary for Quesnel Lake

| SURVEY # | SAMPLE DATE | TOW | AREA | SAMPLE TIME | DURATION (min) | DEPTH (m) | SKY CODE | LIGHT CODE | WIND DIR | SURFACE TEMP (C) | CATCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8703 | AUG 13/87 | 870024 | 5 | 01:10 | 20 | 17 | | 1 | 4 0 | | 10 AGE 0 |
| | AUG 13/87 | 870025 | 3 | 02:06 | 20 | 17 | | 1 | 4 0 | | 7 AGE 0 |
| | | | | | | | | | | | 1 AGE 1 |
| 8706 | OCT 9/87 | 870029 | 3 | 23:00 | 20 | 19 | | | | | NONE |
| | OCT 10/87 | 870030 | 5 | 20:21 | 20 | 20 | | | | | NONE |
| | OCT 10/87 | 870031 | 3 | 21:53 | 30 | 20 | | | | | 2 AGE 0 |
| 8808 | AUG 15/88 | 880034 | 2 | 22:10 | 30 | 25-15 | | 6 | 3 | | 14 AGE 0 |
| | | | | | | | | | | | 1 AGE 1 |
| | AUG 16/88 | 880035 | 2 | 01:25 | 60 | 30-25 | | 3 | 3 | | 2 AGE 2+ |
| | AUG 17/88 | 880036 | 3 | 02:30 | 90 | 30-25 | | 2 | 3 | | 3 AGE 0 |
| | | | | | | | | | | | 1 AGE 1 |
| | | | | | | | | | | | 1 AGE 2+ |
| 8813 | OCT 16/88 | 880055 | 2 | 20:30 | 120 | 37-50 | | 1 | 4 | | NONE |
| | OCT 16/88 | 880056 | 2 | 22:00 | 90 | 37-50 | | 1 | 4 | | NONE |
| 8917 | OCT 24/89 | 890036 | 2 | 18:00 | 60 | 30-11 | | 5 | 3 | | NONE |
| | OCT 24/89 | 890037 | 3 | 21:15 | 60 | 7-5 | | 5 | 3 | | 5 AGE 0 |
| | | | | | | | | | | | 2 WHITEFISH |
| | OCT 24/89 | 890038 | 3 | 22:30 | 60 | 5-7 | | 5 | 3 | | 11 AGE 0 |
| | | | | | | | | | | | 4 AGE 1 |
| | | | | | | | | | | | 1 WHITEFISH |
| | OCT 25/89 | 890039 | 2 | 01:10 | 60 | 39 | | 5 | 3 | | NONE |
| 9008 | MAY 15/90 | 900049 | 2 | 10:30 | 1 | | | | | | 27 AGE 0 |
| | MAY 15/90 | 900050 | 1 | 11:55 | 1 | | | | | | 38 AGE 0 |
| | MAY 15/90 | 900051 | 2 | 14:49 | 1 | | | | | | 36 AGE 0 |
| | MAY 15/90 | 900052 | 2 | 16:17 | 1 | | | | | | 20 AGE 0 |
| | MAY 16/90 | 900053 | 4 | 10:40 | 1 | | | | | | 283 AGE 0 |
| 9014 | JUN 19/90 | 900054 | | 10:30 | 1 | | | | | | 10 AGE 0 |
| | JUN 19/90 | 900055 | | 12:00 | 1 | | | | | | 34 AGE 0 |
| | JUN 19/90 | 900056 | | 13:40 | 1 | | | | | | 23 AGE 0 |
| | JUN 20/90 | 900057 | | 13:00 | 1 | | | | | | 30 AGE 0 |
| 9016 | JUL 17/90 | 900027 | 2 | 22:44 | 10 | 11 | | 3 | 3 | | 51 AGE 0 |
| | JUL 18/90 | 900028 | 4 | 22:15 | 15 | 11 | | 1 | 3 | | 215 AGE 0 |
| | JUL 18/90 | 900028 | 4 | 22:15 | 15 | 11 | | 1 | 3 | | 1 AGE 1 |
| | JUL 18/90 | 900029 | 3 | 23:59 | 10 | 18 | | 1 | 3 | | 470 AGE 0 |
| 9020 | AUG 22/90 | 900042 | 1 | 21:30 | 5 | 11 | | 2 | 3 | 0 | 263 AGE 0 |
| | AUG 22/90 | 900043 | 2 | 23:40 | 5 | 11 | | 2 | 3 | 0 | 116 AGE 0 |
| | AUG 23/90 | 900044 | 3 | 01:25 | 5 | 18 | | 2 | 3 | 0 | 39 AGE 0 |
| | AUG 24/90 | 900045 | 5 | 00:30 | 5 | 18 | | 1 | 3 | N | 213 AGE 0 |
| | AUG 24/90 | 900046 | 5 | 19:25 | 15 | 18 | | 1 | | | NONE |
| | AUG 24/90 | 900047 | 5 | 19:45 | 15 | 11 | | 1 | | | 2 AGE 0 |
| | AUG 24/90 | 900048 | 5 | 20:05 | 10 | 11 | | 2 | | | 38 AGE 0 |

Table 3a - Tow summary for Quesnel Lake

| SURVEY # | SAMPLE DATE | TOW | AREA | SAMPLE TIME | DURATION (min), | DEPTH (m) | SKY CODE | LIGHT CODE | WIND DIR | SURFACE TEMP (C) | CATCH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9022 | SEP 20/90 | 900059 | 1 | 20:23 | 10 | 11 | | 3 | 3 | 0 | 115 AGE 0 |
| | SEP 20/90 | 900060 | 2 | 22:45 | 7 | 25 | | 3 | 3 | W | 290 AGE 0 |
| | SEP 21/90 | 900061 | 3 | 01:14 | 5 | 18 | | 3 | 3 | N | 61 AGE 0 |
| | SEP 21/90 | 900062 | 3 | 01:38 | 10 | 32 | | 3 | 3 | N | 37 AGE 0 |
| | SEP 21/90 | 900063 | 4 | 03:20 | 5 | 18 | | 3 | 3 | 0 | 12 AGE 0 |
| | SEP 21/90 | 900063 | 4 | 03:20 | 5 | 18 | | 3 | 3 | 0 | 1 AGE 1 |
| | SEP 21/90 | 900064 | 5 | 21:22 | 10 | 18 | | 1 | 3 | E | 52 AGE 0 |
| 9023 | OCT 25/90 | 900065 | 2 | 20:20 | 15 | 39 | | 2 | 3 | W | 104 AGE 0 |
| | OCT 25/90 | 900066 | 2 | 20:45 | 5 | 11 | | 2 | 3 | W | 7 AGE 0 |
| | OCT 26/90 | 900067 | 6 | 20:03 | 60 | 11 | | 2 | 3 | E | 35 AGE 0 |
| | OCT 27/90 | 900068 | 5 | 00:05 | 30 | 32 | | 2 | 3 | E | 28 AGE 0 |
| | OCT 28/90 | 900069 | 1 | 19:05 | 15 | 39 | | 2 | 3 | E | 43 AGE 0 |
| | OCT 28/90 | 900070 | 3 | 22:25 | 10 | 39 | | 2 | 3 | | 82 AGE 0 |
| | OCT 28/90 | 900071 | 3 | 23:00 | 5 | 18 | | 2 | 3 | | 15 AGE 0 |

Table 3b - Trawl statistics by survey for Quesnel Lake

| SURVEY# | DATES | CATCH | | LENGTH (mm) | | | | | WEIGHT (g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SPECIES | N | MEAN | MAX | MIN | S.D. | VAR | MEAN | MAX | MIN | S.D. | VAR |
| 8602 | JUL 22-24/86 | AGE 0 | 810 | 42.31 | 63 | 24 | 5.90 | 34.80 | 0.82 | 2.55 | 0.12 | 0.36 | 0.13 |
| 8604 | AUG 24-25/86 | AGE 0 | 426 | 59.40 | 76 | 26 | 6.48 | 42.01 | 2.30 | 4.89 | 0.16 | 0.74 | 0.55 |
| | | CYPRINID | 1 | 37.00 | 37 | 37 | 0.00 | 0.00 | 0.58 | 0.58 | 0.58 | 0.00 | 0.00 |
| | | WHITEFISH | 1 | 53.00 | 53 | 53 | 0.00 | 0.00 | 1.90 | 1.90 | 1.90 | 0.00 | 0.00 |
| 8606 | SEP 24-26/86 | AGE 0 | 363 | 67.77 | 94 | 31 | 8.22 | 67.57 | 3.41 | 9.10 | 0.34 | 1.22 | 1.49 |
| 8607 | OCT 28-29/86 | AGE 0 | 380 | 71.20 | 98 | 46 | 7.52 | 56.54 | 3.89 | 9.62 | 1.00 | 1.26 | 1.58 |
| | | AGE 2+ | 2 | 185.00 | 190 | 180 | 5.00 | 25.00 | 84.07 | 86.11 | 82.03 | 2.04 | 4.16 |
| 8703 | AUG 11-13/87 | AGE 0 | 323 | 54.26 | 75 | 31 | 7.06 | 49.84 | 1.82 | 5.01 | 0.32 | 0.68 | 0.46 |
| | | AGE 1 | 13 | 117.62 | 142 | 91 | 12.21 | 149.01 | 19.61 | 33.71 | 7.98 | 6.09 | 37.12 |
| | | AGE 2+ | 3 | 194.00 | 205 | 180 | 10.42 | 108.67 | 86.33 | 97.27 | 68.22 | 12.90 | 166.40 |
| 8706 | OCT 9-10/87 | AGE 0 | 2 | 63.50 | 65 | 62 | 1.50 | 2.25 | 2.67 | 2.87 | 2.47 | 0.20 | 0.04 |
| 8808 | AUG 15-17/88 | AGE 0 | 17 | 50.29 | 65 | 36 | 7.41 | 54.91 | 1.39 | 2.51 | 0.54 | 0.52 | 0.27 |
| | | AGE 1 | 2 | 141.50 | 153 | 130 | 11.50 | 132.25 | 32.56 | 42.27 | 22.86 | 9.70 | 94.19 |
| | | AGE 2+ | 3 | 178.67 | 185 | 175 | 4.50 | 20.22 | 70.40 | 75.69 | 65.77 | 4.08 | 16.61 |
| 8813 | OCT 16/88 | NONE | | | | | | | | | | | |
| 8917 | OCT 24-25/89 | AGE 0 | 16 | 83.00 | 97 | 53 | 12.02 | 144.50 | 7.30 | 10.59 | 1.51 | 2.56 | 6.57 |
| | | AGE 1 | 4 | 113.75 | 117 | 111 | 2.38 | 5.69 | 16.65 | 20.32 | 11.90 | 3.52 | 12.42 |
| | | WHITEFISH | 3 | 65.00 | 71 | 56 | 6.48 | 42.00 | 2.90 | 3.53 | 1.72 | 0.84 | 0.70 |
| 9008 | MAY 14-18/90 | AGE 0 | 404 | 25.09 | 34 | 15 | 2.07 | 4.30 | 0.18 | 0.40 | 0.10 | 0.04 | 0.00 |
| 9014 | JUN 18-22/90 | AGE 0 | 97 | 28.58 | 33 | 24 | 2.23 | 4.99 | 0.25 | 0.47 | 0.10 | 0.08 | 0.01 |
| 9016 | JUL 16-20/90 | AGE 0 | 736 | 46.27 | 68 | 24 | 6.77 | 45.88 | 1.18 | 3.75 | 0.10 | 0.51 | 0.26 |
| | | AGE 1 | 1 | 134.00 | 134 | 134 | 0.00 | 0.00 | 31.00 | 31.00 | 31.00 | 0.00 | 0.00 |

Table 3b - Trawl statistics by survey for Quesnel Lake

| SURVEY# | DATES | CATCH | | LENGTH (mm) | | | | | WEIGHT (g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SPECIES | N | MEAN | MAX | MIN | S.D. | VAR | MEAN | MAX | MIN | S.D. | VAR |
| 9020 | AUG 22-24/90 | AGE 0 | 701 | 60.60 | 83 | 28 | 7.47 | 55.83 | 2.43 | 7.12 | 0.19 | 0.91 | 0.82 |
| 9022 | SEP 20-21/90 | AGE 0 | 567 | 67.22 | 89 | 26 | 7.37 | 54.28 | 3.29 | 8.29 | 0.15 | 1.16 | 1.35 |
| | | AGE 1 | 1 | 171.00 | 171 | 171 | 0.00 | 0.00 | 71.16 | 71.16 | 71.16 | 0.00 | 0.00 |
| 9023 | OCT 25-28/90 | AGE 0 | 314 | 69.86 | 89 | 46 | 7.33 | 53.79 | 3.27 | 7.12 | 0.90 | 1.12 | 1.25 |

Table 3c - Trawl statistics by tow for Quesnel Lake

| AREA | DATE | TRAWL TOW | DEPTH (m) | DURATION (min) | CATCH SPECIES | N | LENGTH (mm) MEAN | MAX | MIN | S.D. | VAR | WEIGHT (g) MEAN | MAX | MIN | S.D. | VAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SURVEY # 8602 | | | | | | | | | | | | | | | | |
| 1 | JUL 22/86 | 860006 | 7 | 5 | NONE | | | | | | | | | | | |
| 1 | JUL 22/86 | 860007 | 13 | 5 | AGE 0 | 127 | 47.74 | 63 | 30 | 5.21 | 27.14 | 1.21 | 2.55 | 0.28 | 0.38 | 0.15 |
| 2 | JUL 23/86 | 860008 | 13 | 3 | AGE 0 | 463 | 41.54 | 57 | 30 | 5.09 | 25.92 | 0.75 | 1.78 | 0.22 | 0.30 | 0.09 |
| 3 | JUL 23/86 | 860009 | 13 | 15 | AGE 0 | 94 | 42.29 | 53 | 25 | 5.41 | 29.27 | 0.81 | 1.50 | 0.13 | 0.29 | 0.09 |
| 5 | JUL 23/86 | 860010 | 13 | 10 | AGE 0 | 65 | 39.09 | 51 | 27 | 5.03 | 25.31 | 0.64 | 1.16 | 0.16 | 0.25 | 0.06 |
| 4 | JUL 24/86 | 860011 | 13 | 10 | AGE 0 | 61 | 40.31 | 54 | 24 | 7.48 | 55.92 | 0.80 | 1.81 | 0.12 | 0.43 | 0.19 |
| SURVEY # 8604 | | | | | | | | | | | | | | | | |
| 1 | AUG 24/86 | 860020 | 19 | 20 | AGE 0 | 2 | 53.50 | 54 | 53 | 0.50 | 0.25 | 1.60 | 1.71 | 1.48 | 0.11 | 0.02 |
| | | | | | CYPRINID | 1 | 37.00 | 37 | 37 | 0.00 | 0.00 | 0.58 | 0.58 | 0.58 | 0.00 | 0.00 |
| | | | | | WHITEFISH | 1 | 53.00 | 53 | 53 | 0.00 | 0.00 | 1.90 | 1.90 | 1.90 | 0.00 | 0.00 |
| 2 | AUG 24/86 | 860021 | 19 | 3 | AGE 0 | 40 | 63.48 | 73 | 48 | 5.03 | 25.30 | 2.74 | 3.89 | 1.10 | 0.63 | 0.40 |
| 3 | AUG 25/86 | 860022 | 13 | 5 | AGE 0 | 234 | 58.22 | 73 | 39 | 6.29 | 39.55 | 2.13 | 4.12 | 0.59 | 0.67 | 0.46 |
| 4 | AUG 25/86 | 860023 | 13 | 10 | AGE 0 | 23 | 55.39 | 70 | 26 | 9.10 | 82.85 | 1.89 | 3.56 | 0.16 | 0.75 | 0.57 |
| 6 | AUG 25/86 | 860024 | 13 | 3 | AGE 0 | 102 | 62.08 | 76 | 46 | 5.01 | 25.09 | 2.71 | 4.89 | 0.90 | 0.71 | 0.51 |
| 5 | AUG 25/86 | 860025 | 13 | 5 | AGE 0 | 25 | 57.24 | 69 | 38 | 5.96 | 35.46 | 1.96 | 3.28 | 0.53 | 0.59 | 0.34 |
| SURVEY # 8606 | | | | | | | | | | | | | | | | |
| 2 | SEP 24/86 | 860028 | 19 | 3 | AGE 0 | 17 | 63.12 | 77 | 37 | 9.50 | 90.34 | 2.92 | 4.78 | 0.42 | 1.09 | 1.18 |
| 2 | SEP 24/86 | 860029 | 25 | 10 | AGE 0 | 18 | 66.44 | 82 | 52 | 9.72 | 94.47 | 3.11 | 5.70 | 1.32 | 1.46 | 2.12 |
| 2 | SEP 25/86 | 860030 | 19 | 15 | AGE 0 | 35 | 70.86 | 81 | 49 | 6.80 | 46.24 | 4.01 | 5.61 | 0.94 | 1.11 | 1.23 |
| 4 | SEP 25/86 | 860031 | 22 | 20 | AGE 0 | 4 | 49.75 | 58 | 40 | 6.42 | 41.19 | 1.19 | 1.67 | 0.67 | 0.37 | 0.13 |
| 3 | SEP 25/86 | 860032 | 19 | 20 | AGE 0 | 13 | 59.69 | 71 | 53 | 5.45 | 29.75 | 2.45 | 3.60 | 1.35 | 0.72 | 0.52 |
| 5 | SEP 26/86 | 860033 | 21 | 20 | AGE 0 | 78 | 70.13 | 89 | 59 | 5.51 | 30.32 | 3.80 | 9.10 | 2.01 | 1.05 | 1.10 |
| 5 | SEP 26/86 | 860034 | 27 | 20 | AGE 0 | 106 | 69.52 | 94 | 54 | 6.79 | 46.08 | 3.61 | 7.45 | 1.67 | 1.09 | 1.19 |
| 6 | SEP 26/86 | 860035 | 17 | 7 | AGE 0 | 70 | 68.13 | 89 | 55 | 6.73 | 45.31 | 3.25 | 8.58 | 1.56 | 1.15 | 1.33 |
| 4 | SEP 26/86 | 860036 | 20 | 20 | AGE 0 | 22 | 57.68 | 75 | 31 | 11.31 | 127.94 | 2.21 | 4.19 | 0.34 | 1.10 | 1.20 |
| SURVEY # 8607 | | | | | | | | | | | | | | | | |
| 2 | OCT 28/86 | 860037 | 32 | 10 | AGE 0 | 109 | 67.91 | 86 | 49 | 6.32 | 39.97 | 3.41 | 6.74 | 1.26 | 0.94 | 0.88 |

Table 3c - Trawl statistics by tow for Quesnel Lake

| TRAWL | | | | | CATCH | | LENGTH (mm) | | | | | WEIGHT (g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA | DATE | TOW | DEPTH (m) | DURATION (min) | SPECIES | N | MEAN | MAX | MIN | S.D. | VAR | MEAN | MAX | MIN | S.D. | VAR |
| 2 | OCT 28/86 | 860038 | 13 | 10 | AGE 0 | 32 | 70.09 | 80 | 52 | 7.28 | 52.96 | 3.73 | 6.00 | 1.43 | 1.12 | 1.25 |
| | | | | | AGE 2+ | 1 | 180.00 | 180 | 180 | 0.00 | 0.00 | 86.11 | 86.11 | 86.11 | 0.00 | 0.00 |
| 1 | OCT 28/86 | 860039 | 26 | 20 | AGE 0 | 8 | 75.25 | 82 | 65 | 6.16 | 37.94 | 4.83 | 6.24 | 2.58 | 1.29 | 1.66 |
| 3 | OCT 28/86 | 860040 | 37 | 15 | AGE 0 | 29 | 71.79 | 89 | 58 | 6.34 | 40.23 | 4.03 | 6.96 | 2.26 | 1.04 | 1.08 |
| 4 | OCT 29/86 | 860041 | 7 | 10 | AGE 0 | 4 | 78.25 | 85 | 73 | 4.66 | 21.69 | 5.22 | 6.80 | 4.17 | 1.10 | 1.22 |
| 4 | OCT 29/86 | 860042 | 38 | 15 | AGE 0 | 121 | 72.60 | 98 | 46 | 7.99 | 63.81 | 4.08 | 9.62 | 1.00 | 1.43 | 2.04 |
| 5 | OCT 29/86 | 860043 | 25 | 10 | AGE 0 | 30 | 72.47 | 89 | 53 | 9.27 | 85.98 | 3.98 | 6.68 | 1.23 | 1.47 | 2.15 |
| | | | | | AGE 1 | 1 | 190.00 | 190 | 190 | 0.00 | 0.00 | 82.03 | 82.03 | 82.03 | 0.00 | 0.00 |
| 6 | OCT 29/86 | 860044 | 27 | 10 | AGE 0 | 47 | 73.53 | 88 | 62 | 5.60 | 31.31 | 4.19 | 7.19 | 2.61 | 1.07 | 1.15 |
| SURVEY # 8703 | | | | | | | | | | | | | | | | |
| 2 | AUG 11/87 | 870020 | 17 | 15 | AGE 0 | 213 | 54.49 | 71 | 39 | 6.05 | 36.61 | 1.84 | 3.97 | 0.70 | 0.61 | 0.37 |
| | | | | | AGE 1 | 1 | 142.00 | 142 | 142 | 0.00 | 0.00 | 33.71 | 33.71 | 33.71 | 0.00 | 0.00 |
| | | | | | AGE 2+ | 2 | 188.50 | 197 | 180 | 8.50 | 72.25 | 80.87 | 93.51 | 68.22 | 12.65 | 159.90 |
| 4 | AUG 12/87 | 870021 | 20 | 10 | AGE 0 | 24 | 55.88 | 69 | 45 | 5.93 | 35.11 | 1.87 | 3.37 | 1.06 | 0.62 | 0.39 |
| | | | | | AGE 2+ | 1 | 205.00 | 205 | 205 | 0.00 | 0.00 | 97.27 | 97.27 | 97.27 | 0.00 | 0.00 |
| 3 | AUG 12/87 | 870022 | 17 | 15 | NONE | | | | | | | | | | | |
| | | | | | AGE 0 | 69 | 54.12 | 75 | 31 | 9.12 | 83.17 | 1.84 | 5.01 | 0.32 | 0.86 | 0.74 |
| | | | | | AGE 1 | 11 | 114.64 | 132 | 91 | 10.33 | 106.78 | 18.04 | 27.13 | 7.98 | 4.73 | 22.40 |
| 5 | AUG 13/87 | 870024 | 17 | 20 | AGE 0 | 10 | 52.00 | 64 | 32 | 9.47 | 89.60 | 1.66 | 2.80 | 0.42 | 0.73 | 0.53 |
| 3 | AUG 13/87 | 870025 | 17 | 20 | AGE 0 | 7 | 46.29 | 57 | 36 | 5.99 | 35.92 | 1.10 | 1.89 | 0.64 | 0.39 | 0.15 |
| | | | | | AGE 1 | 1 | 126.00 | 126 | 126 | 0.00 | 0.00 | 22.80 | 22.80 | 22.80 | 0.00 | 0.00 |
| SURVEY # 8706 | | | | | | | | | | | | | | | | |
| 3 | OCT 9/87 | 870029 | 19 | 20 | NONE | | | | | | | | | | | |
| 5 | OCT 10/87 | 870030 | 20 | 20 | NONE | | | | | | | | | | | |
| 3 | OCT 10/87 | 870031 | 20 | 30 | AGE 0 | 2 | 63.50 | 65 | 62 | 1.50 | 2.25 | 2.67 | 2.87 | 2.47 | 0.20 | 0.04 |
| SURVEY # 8808 | | | | | | | | | | | | | | | | |
| 2 | AUG 15/88 | 880034 | 25-15 | 30 | AGE 0 | 14 | 50.00 | 65 | 41 | 6.08 | 37.00 | 1.37 | 2.51 | 0.78 | 0.44 | 0.19 |
| | | | | | AGE 1 | 1 | 153.00 | 153 | 153 | 0.00 | 0.00 | 42.27 | 42.27 | 42.27 | 0.00 | 0.00 |
| 2 | AUG 16/88 | 880035 | 30-25 | 60 | AGE 2+ | 2 | 180.00 | 185 | 175 | 5.00 | 25.00 | 70.73 | 75.69 | 65.77 | 4.96 | 24.60 |

Table 3c - Trawl statistics by tow for Quesnel Lake

| TRAWL | | | | | CATCH | | LENGTH (mm) | | | | | WEIGHT (g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA | DATE | TOW | DEPTH (m) | DURATION (min) | SPECIES | N | MEAN | MAX | MIN | S.D. | VAR | MEAN | MAX | MIN | S.D. | VAR |
| 3 | AUG 17/88 | 880036 | 30-25 | 90 | AGE 0 | 3 | 51.67 | 64 | 36 | 11.67 | 136.22 | 1.52 | 2.47 | 0.54 | 0.79 | 0.62 |
| | | | | | AGE 1 | 1 | 130.00 | 130 | 130 | 0.00 | 0.00 | 22.86 | 22.86 | 22.86 | 0.00 | 0.00 |
| | | | | | AGE 2+ | 1 | 176.00 | 176 | 176 | 0.00 | 0.00 | 69.75 | 69.75 | 69.75 | 0.00 | 0.00 |
| SURVEY # 8813 | | | | | | | | | | | | | | | | |
| 2 | OCT 16/88 | 880055 | 37-50 | 120 | NONE | | | | | | | | | | | |
| 2 | OCT 16/88 | 880056 | 37-50 | 90 | NONE | | | | | | | | | | | |
| SURVEY # 8917 | | | | | | | | | | | | | | | | |
| 2 | OCT 24/89 | 890036 | 30-11 | 60 | NONE | | | | | | | | | | | |
| 3 | OCT 24/89 | 890037 | 7-5 | 60 | AGE 0 | 5 | 83.00 | 91 | 72 | 6.42 | 41.20 | 7.41 | 9.70 | 4.03 | 2.01 | 4.05 |
| | | | | | WHITEFISH | 2 | 63.50 | 71 | 56 | 7.50 | 56.25 | 2.63 | 3.53 | 1.72 | 0.90 | 0.82 |
| 3 | OCT 24/89 | 890038 | 5-7 | 60 | AGE 0 | 11 | 83.00 | 97 | 53 | 13.84 | 91.45 | 7.26 | 10.59 | 1.51 | 2.78 | 7.71 |
| | | | | | AGE 1 | 4 | 113.75 | 117 | 111 | 2.38 | 5.69 | 16.65 | 20.32 | 11.90 | 3.52 | 12.42 |
| | | | | | WHITEFISH | 1 | 68.00 | 68 | 68 | 0.00 | 0.00 | 3.46 | 3.46 | 3.46 | 0.00 | 0.00 |
| 2 | OCT 25/89 | 890039 | 39 | 60 | NONE | | | | | | | | | | | |
| SURVEY # 9008 | | | | | | | | | | | | | | | | |
| 2 | MAY 15/90 | 900049 | 1 | | DIPNET | AGE 0 | 27 | 23.74 | 27 | 18 | 2.63 | 6.93 | 0.18 | 0.29 | 0.13 | 0.04 | 0.00 |
| 1 | MAY 15/90 | 900050 | 1 | | DIPNET | AGE 0 | 38 | 23.29 | 26 | 20 | 1.43 | 2.05 | 0.16 | 0.27 | 0.12 | 0.03 | 0.00 |
| 2 | MAY 15/90 | 900051 | 1 | | DIPNET | AGE 0 | 36 | 24.11 | 28 | 21 | 1.37 | 1.88 | 0.17 | 0.34 | 0.13 | 0.04 | 0.00 |
| 2 | MAY 15/90 | 900052 | 1 | | DIPNET | AGE 0 | 20 | 24.55 | 26 | 22 | 1.07 | 1.15 | 0.16 | 0.20 | 0.13 | 0.02 | 0.00 |
| 4 | MAY 16/90 | 900053 | 1 | | DIPNET | AGE 0 | 283 | 25.63 | 34 | 15 | 1.96 | 3.85 | 0.18 | 0.40 | 0.10 | 0.05 | 0.00 |
| SURVEY # 9014 | | | | | | | | | | | | | | | | |
| | JUN 19/90 | 900054 | 1 | | DIPNET | AGE 0 | 10 | 29.50 | 32 | 26 | 1.80 | 3.25 | 0.27 | 0.35 | 0.14 | 0.07 | 0.00 |
| | JUN 19/90 | 900055 | 1 | | DIPNET | AGE 0 | 34 | 27.82 | 31 | 24 | 1.89 | 3.56 | 0.21 | 0.35 | 0.12 | 0.06 | 0.00 |
| | JUN 19/90 | 900056 | 1 | | DIPNET | AGE 0 | 23 | 27.43 | 32 | 24 | 2.12 | 4.51 | 0.20 | 0.33 | 0.10 | 0.06 | 0.00 |
| | JUN 20/90 | 900057 | 1 | | DIPNET | AGE 0 | 30 | 30.00 | 33 | 26 | 1.90 | 3.60 | 0.31 | 0.47 | 0.18 | 0.07 | 0.00 |

Table 3c - Trawl statistics by tow for Quesnel Lake

| AREA | DATE | TOW | TRAWL DEPTH (m) | TRAWL DURATION (min) | CATCH SPECIES | CATCH N | LENGTH (mm) MEAN | LENGTH (mm) MAX | LENGTH (mm) MIN | LENGTH (mm) S.D. | LENGTH (mm) VAR | WEIGHT (g) MEAN | WEIGHT (g) MAX | WEIGHT (g) MIN | WEIGHT (g) S.D. | WEIGHT (g) VAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SURVEY # 9016 | | | | | | | | | | | | | | | | |
| 2 | JUL 17/90 | 900027 | 11 | 10 | AGE 0 | 51 | 49.24 | 68 | 38 | 5.87 | 34.42 | 1.34 | 3.75 | 0.56 | 0.56 | 0.31 |
| 4 | JUL 18/90 | 900028 | 11 | 15 | AGE 0 | 215 | 47.86 | 65 | 24 | 9.42 | 88.80 | 1.41 | 3.13 | 0.10 | 0.68 | 0.46 |
| | | | | | AGE 1 | 1 | 134.00 | 134 | 134 | 0.00 | 0.00 | 31.00 | 31.00 | 31.00 | 0.00 | 0.00 |
| 3 | JUL 18/90 | 900029 | 18 | 10 | AGE 0 | 470 | 45.22 | 61 | 26 | 4.93 | 24.28 | 1.06 | 2.85 | 0.15 | 0.36 | 0.13 |
| SURVEY # 9020 | | | | | | | | | | | | | | | | |
| 1 | AUG 22/90 | 900042 | 11 | 5 | AGE 0 | 263 | 61.57 | 83 | 30 | 7.91 | 62.63 | 2.77 | 7.12 | 0.19 | 1.04 | 1.09 |
| 2 | AUG 22/90 | 900043 | 11 | 5 | AGE 0 | 116 | 60.40 | 74 | 41 | 6.73 | 45.34 | 2.26 | 4.16 | 0.64 | 0.74 | 0.55 |
| 3 | AUG 23/90 | 900044 | 18 | 5 | AGE 0 | 69 | 57.46 | 72 | 28 | 9.29 | 86.25 | 1.98 | 3.86 | 0.21 | 0.83 | 0.69 |
| 5 | AUG 24/90 | 900045 | 18 | 5 | AGE 0 | 213 | 61.08 | 75 | 41 | 5.87 | 34.46 | 2.34 | 4.24 | 0.72 | 0.68 | 0.46 |
| 5 | AUG 24/90 | 900046 | 18 | 15 | NONE | | | | | | | | | | | |
| 5 | AUG 24/90 | 900047 | 11 | 15 | AGE 0 | 2 | 54.50 | 59 | 50 | 4.50 | 20.25 | 1.75 | 2.19 | 1.30 | 0.44 | 0.20 |
| 5 | AUG 24/90 | 900048 | 11 | 10 | AGE 0 | 38 | 57.79 | 72 | 34 | 8.46 | 71.59 | 2.01 | 3.63 | 0.49 | 0.75 | 0.56 |
| SURVEY # 9022 | | | | | | | | | | | | | | | | |
| 1 | SEP 20/90 | 900059 | 11 | 10 | AGE 0 | 115 | 69.00 | 82 | 58 | 5.49 | 30.10 | 3.68 | 7.16 | 2.00 | 1.09 | 1.20 |
| 2 | SEP 20/90 | 900060 | 25 | 7 | AGE 0 | 290 | 68.04 | 89 | 48 | 6.18 | 38.17 | 3.35 | 8.29 | 0.15 | 1.07 | 1.15 |
| 3 | SEP 21/90 | 900061 | 18 | 5 | AGE 0 | 61 | 64.87 | 79 | 26 | 9.60 | 92.18 | 2.92 | 5.22 | 0.16 | 1.10 | 1.21 |
| 3 | SEP 21/90 | 900062 | 32 | 10 | AGE 0 | 37 | 63.14 | 80 | 43 | 8.07 | 65.20 | 2.60 | 5.05 | 0.69 | 0.98 | 0.97 |
| 4 | SEP 21/90 | 900063 | 18 | 5 | AGE 0 | 12 | 62.92 | 74 | 34 | 10.68 | 114.08 | 2.67 | 4.51 | 0.48 | 1.12 | 1.26 |
| | | | | | AGE 1 | 1 | 171.00 | 171 | 171 | 0.00 | 0.00 | 71.16 | 71.16 | 71.16 | 0.00 | 0.00 |
| 5 | SEP 21/90 | 900064 | 18 | 10 | AGE 0 | 52 | 65.37 | 83 | 34 | 9.73 | 94.69 | 3.17 | 6.72 | 0.39 | 1.51 | 2.29 |

Table 3c - Trawl statistics by tow for Quesnel Lake

| TRAWL | | | | | CATCH | | LENGTH (mm) | | | | | WEIGHT (g) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA | DATE | TOW | DEPTH (m) | DURATION (min) | SPECIES | N | MEAN | MAX | MIN | S.D. | VAR | MEAN | MAX | MIN | S.D. | VAR |
| SURVEY # 9023 | | | | | | | | | | | | | | | | |
| 2 | OCT 25/90 | 900065 | 39 | 15 | AGE 0 | 104 | 71.24 | 89 | 58 | 6.41 | 41.07 | 3.35 | 6.11 | 1.73 | 0.97 | 0.94 |
| 2 | OCT 25/90 | 900066 | 11 | 5 | AGE 0 | 7 | 65.86 | 80 | 53 | 8.94 | 79.84 | 2.90 | 5.03 | 1.32 | 1.27 | 1.61 |
| 6 | OCT 26/90 | 900067 | 11 | 60 | AGE 0 | 35 | 69.89 | 85 | 55 | 7.58 | 57.53 | 3.34 | 6.07 | 1.49 | 1.14 | 1.30 |
| 5 | OCT 27/90 | 900068 | 32 | 30 | AGE 0 | 28 | 69.00 | 89 | 54 | 7.79 | 60.71 | 3.11 | 7.12 | 1.12 | 1.31 | 1.70 |
| 1 | OCT 28/90 | 900069 | 39 | 15 | AGE 0 | 43 | 71.02 | 87 | 54 | 7.05 | 49.65 | 3.49 | 6.26 | 1.41 | 1.11 | 1.23 |
| 3 | OCT 28/90 | 900070 | 39 | 10 | AGE 0 | 82 | 68.51 | 87 | 46 | 7.91 | 62.64 | 3.19 | 6.83 | 0.90 | 1.22 | 1.48 |
| 3 | OCT 28/91 | 900071 | 18 | 5 | AGE 0 | 15 | 67.73 | 75 | 58 | 5.59 | 31.26 | 2.83 | 3.77 | 1.59 | 0.69 | 0.47 |

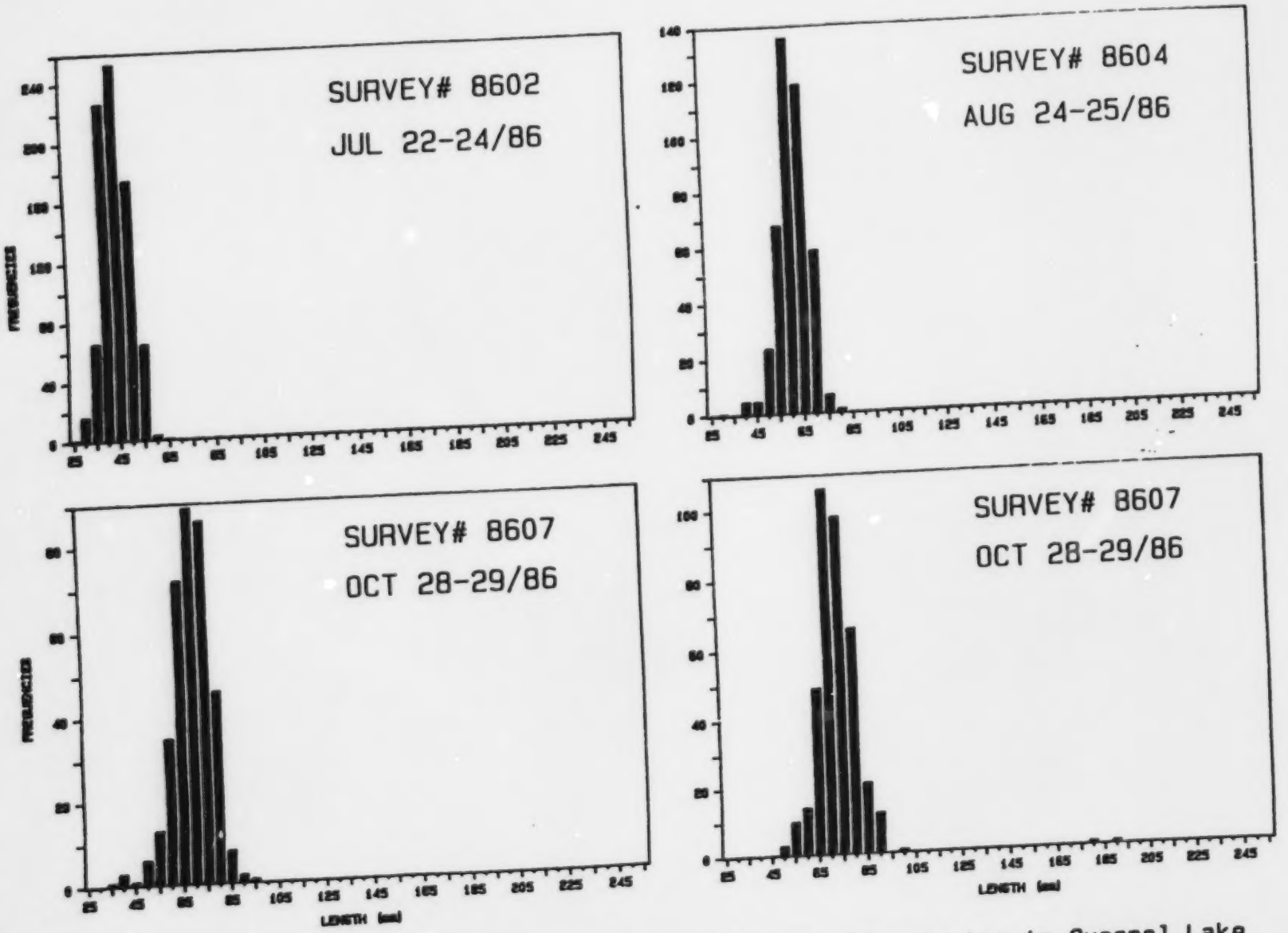



Fig. 3. Sockeye (O. nerka) length frequencies in Quesnel Lake.

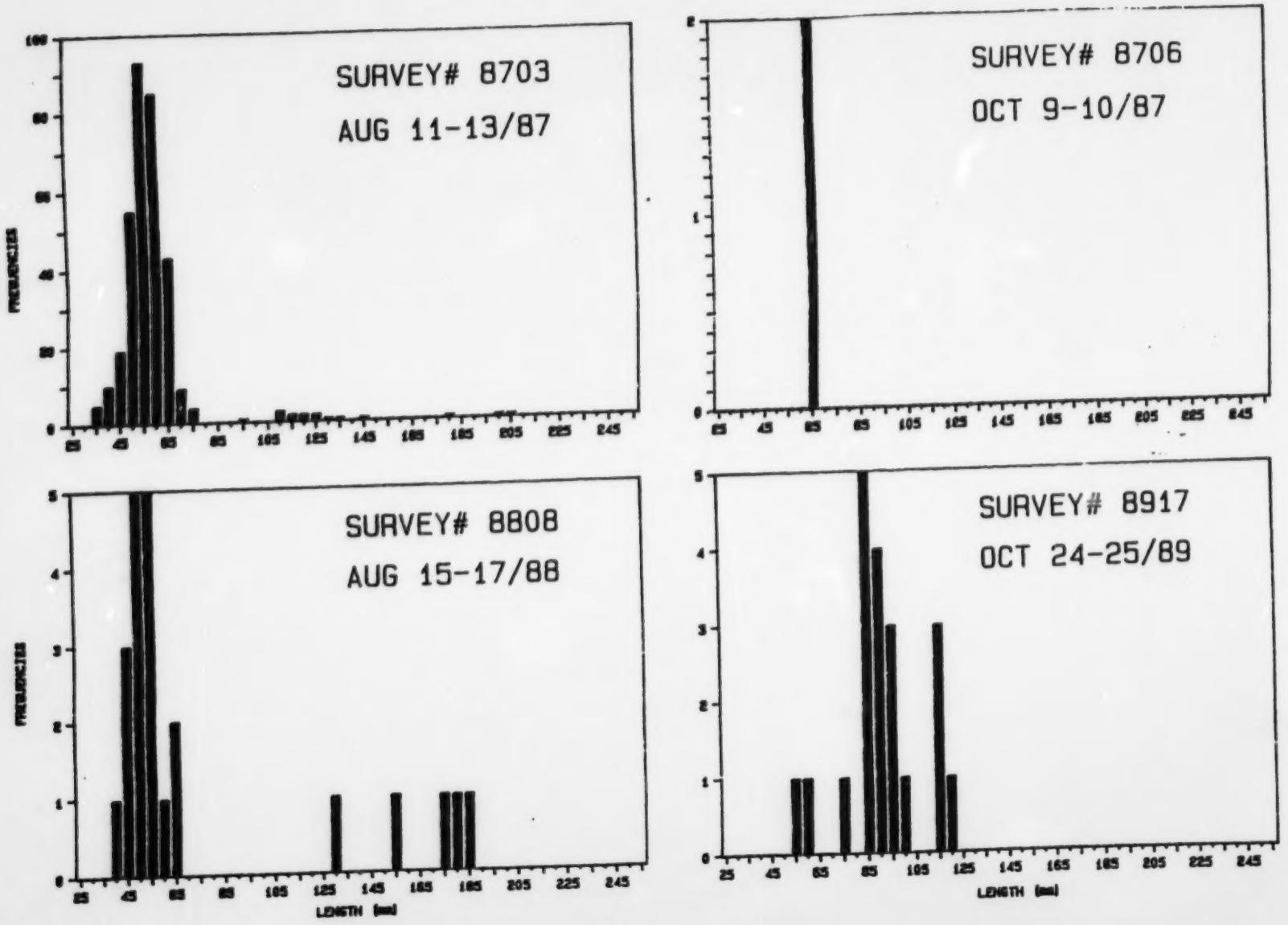



Fig. 3. Continued.

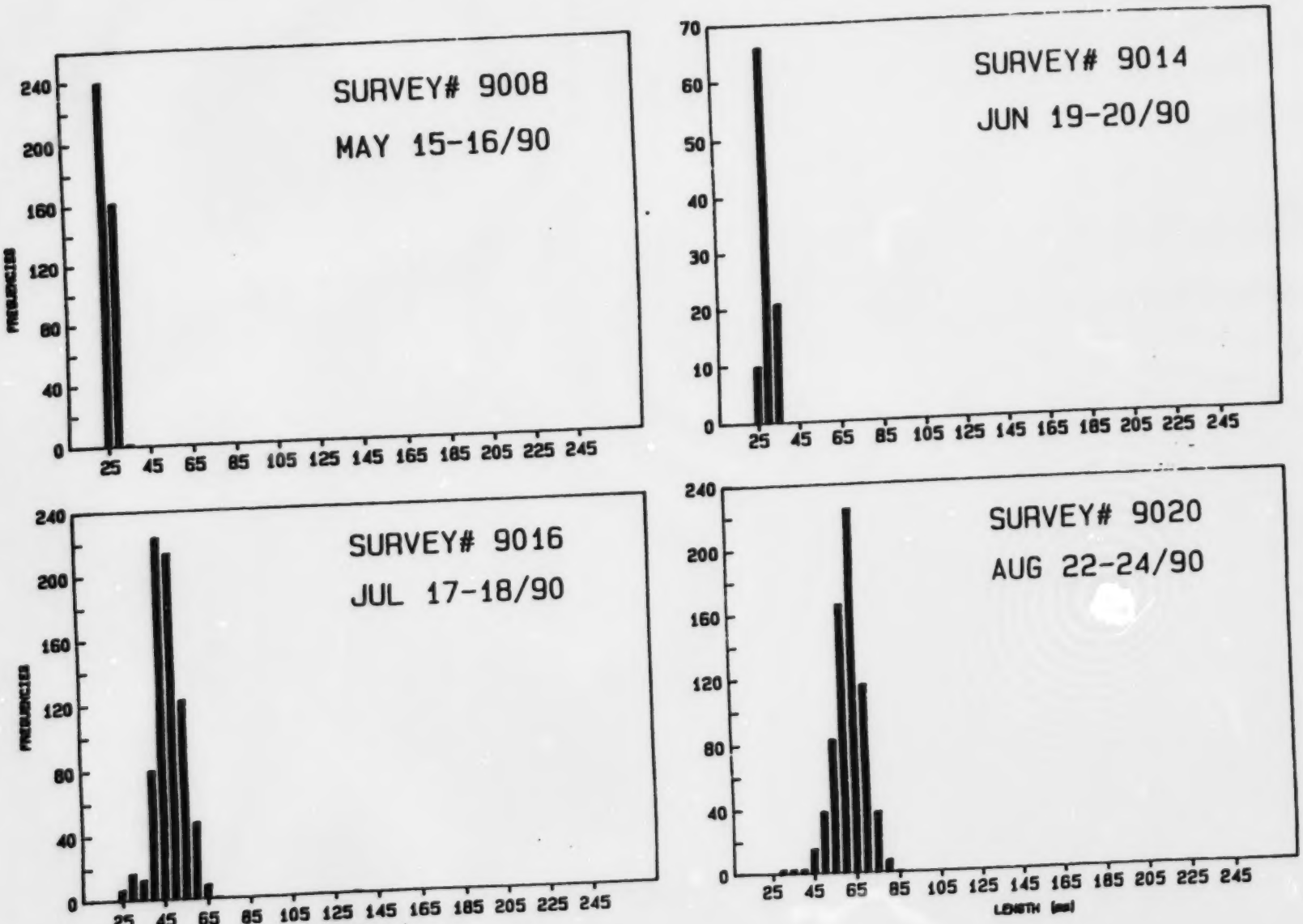
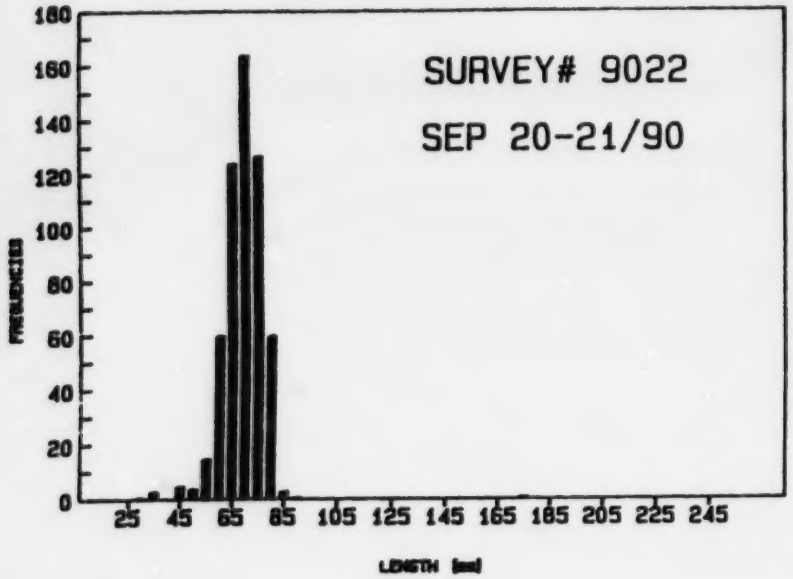



Fig. 3. Continued.



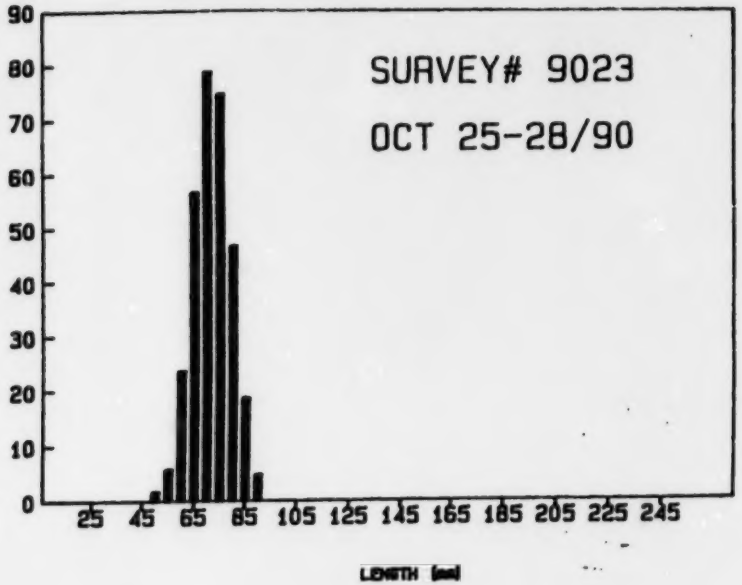




Fig. 3. Continued.